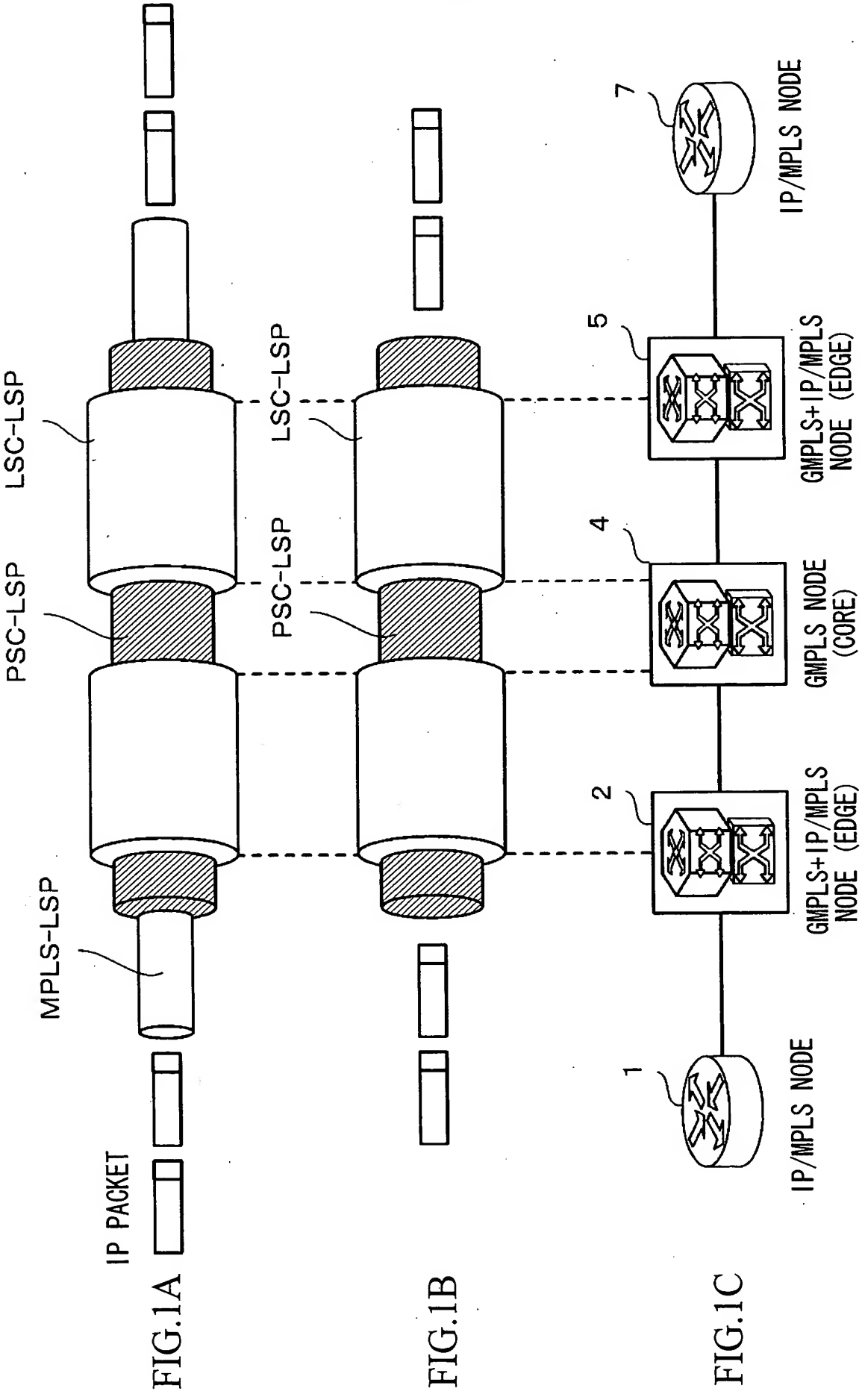
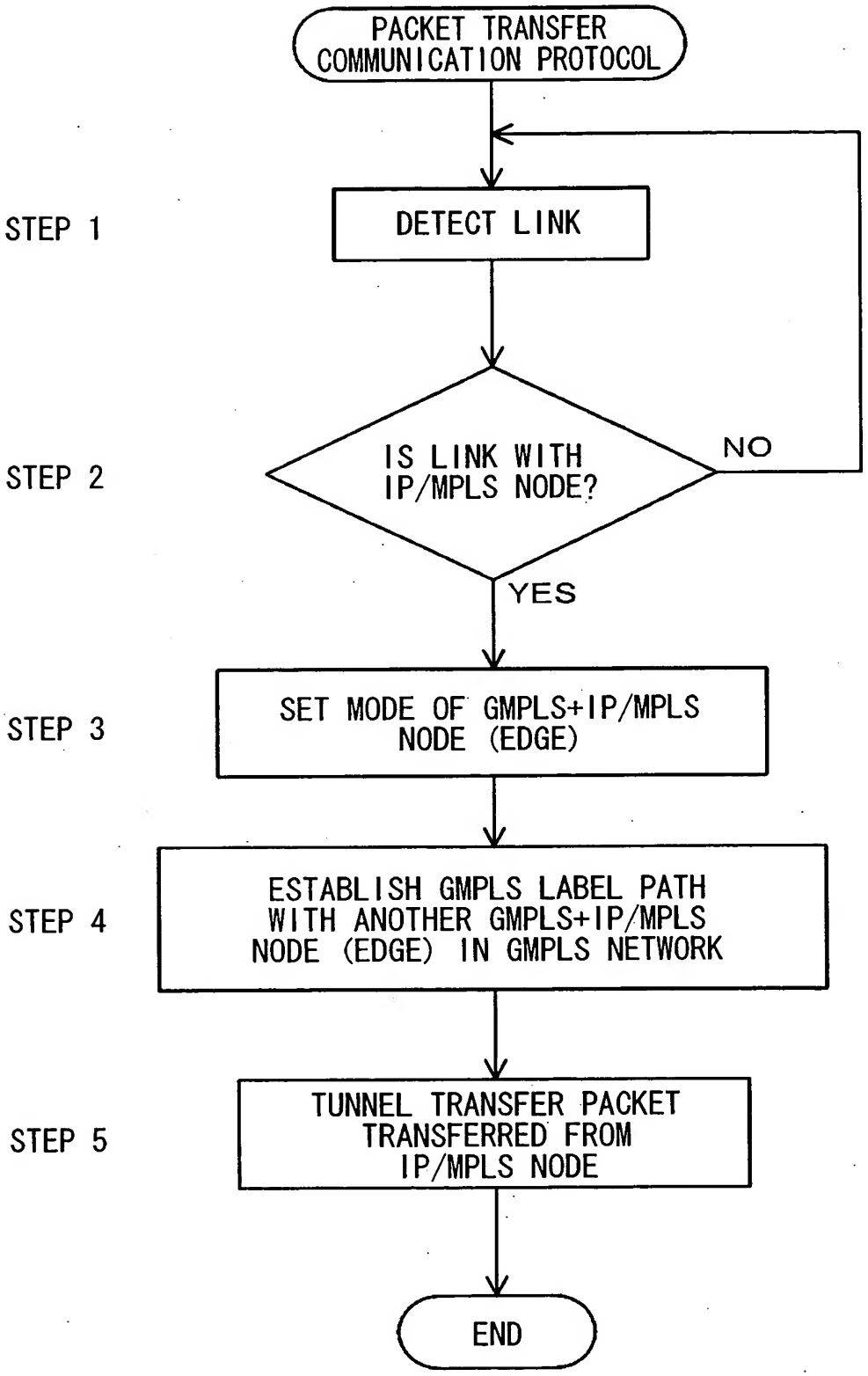


FIG.1A FIG.1B FIG.1C

FIG.2


PACKET TRANSFER COMMUNICATION PROTOCOL
STEP 1
DETECT LINK
STEP 2
IS LINK WITH IP/MPLS NODE?
NO
YES
STEP 3
SET MODE OF GMPLS+IP/MPLS NODE (EDGE)
STEP 4
ESTABLISH GMPLS LABEL PATH WITH ANOTHER GMPLS+IP/MPLS NODE (EDGE) IN GMPLS NETWORK
STEP 5
TUNNEL TRANSFER PACKET TRANSFERRED FROM IP/MPLS NODE
END

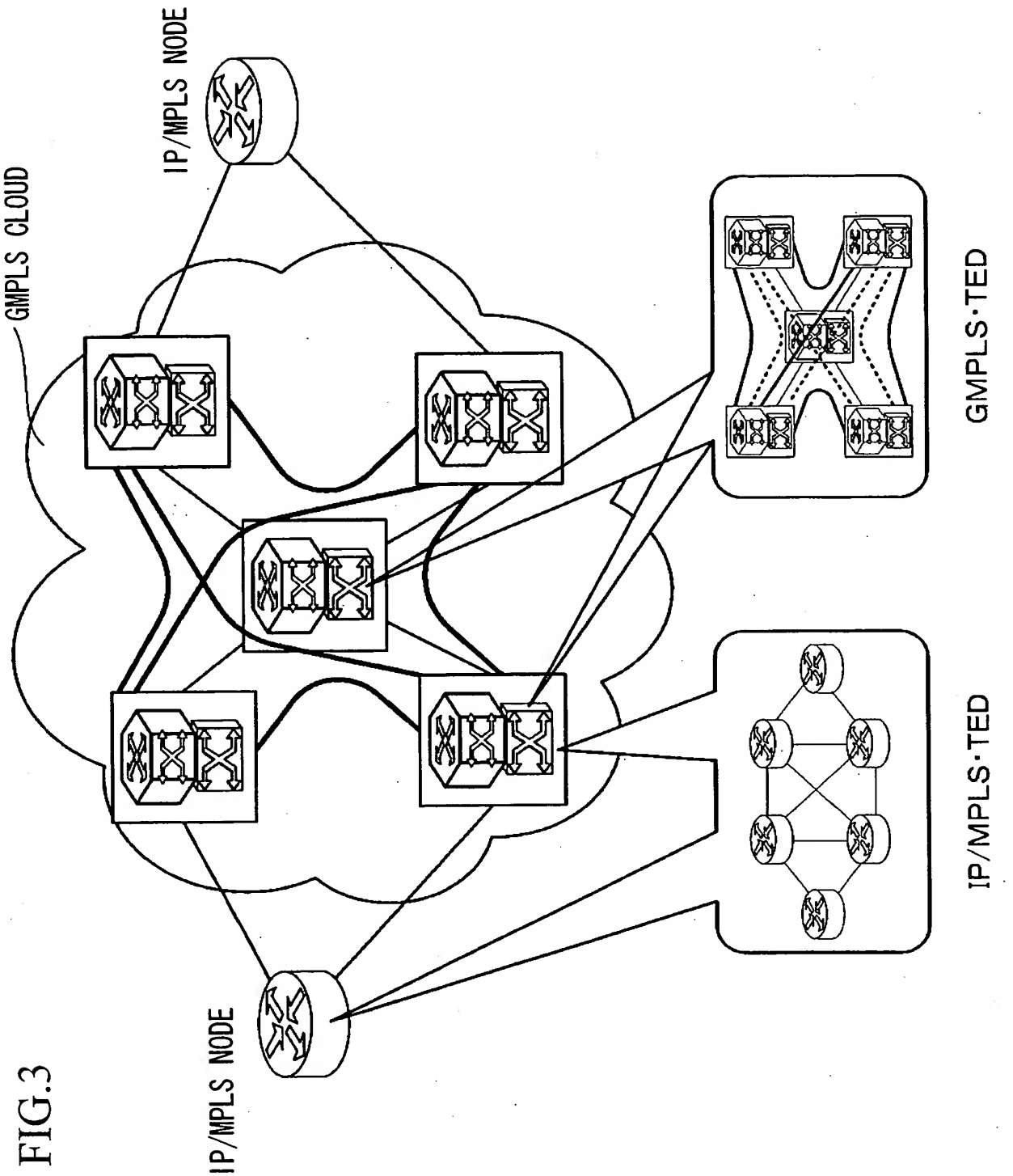


FIG.3

FIG.4

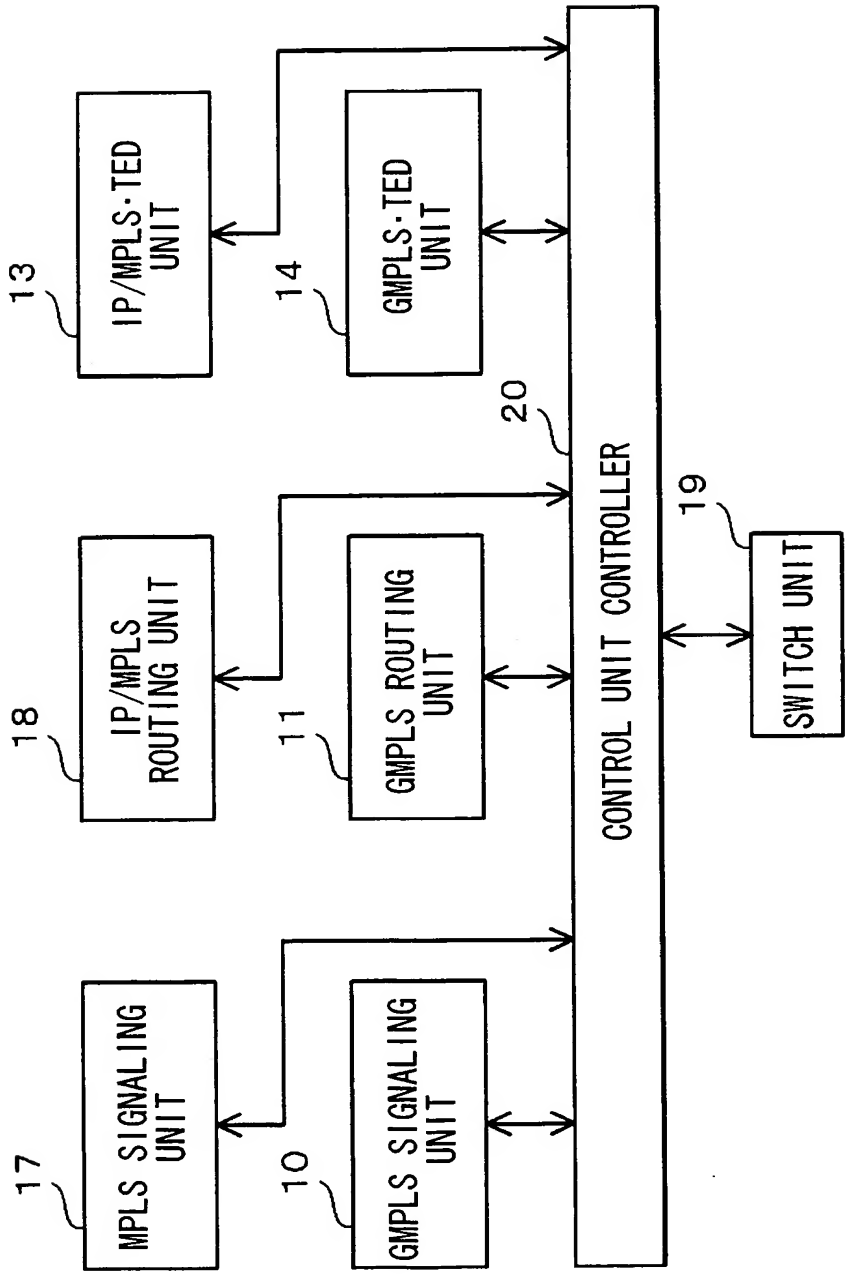

13
IP/MPLS·TED UNIT
14
GMPLS·TED UNIT
20
CONTROL UNIT CONTROLLER
19
SWITCH UNIT
18
IP/MPLS ROUTING UNIT
11
GMPLS ROUTING UNIT
17
MPLS SIGNALING UNIT
10
GMPLS SIGNALING UNIT

FIG.5

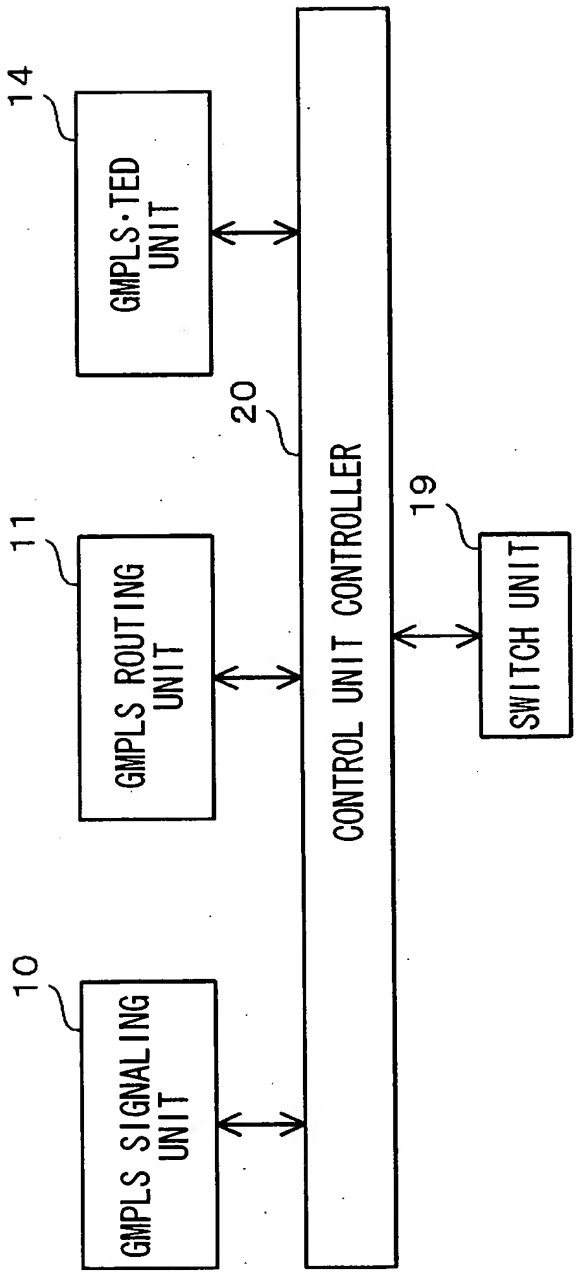
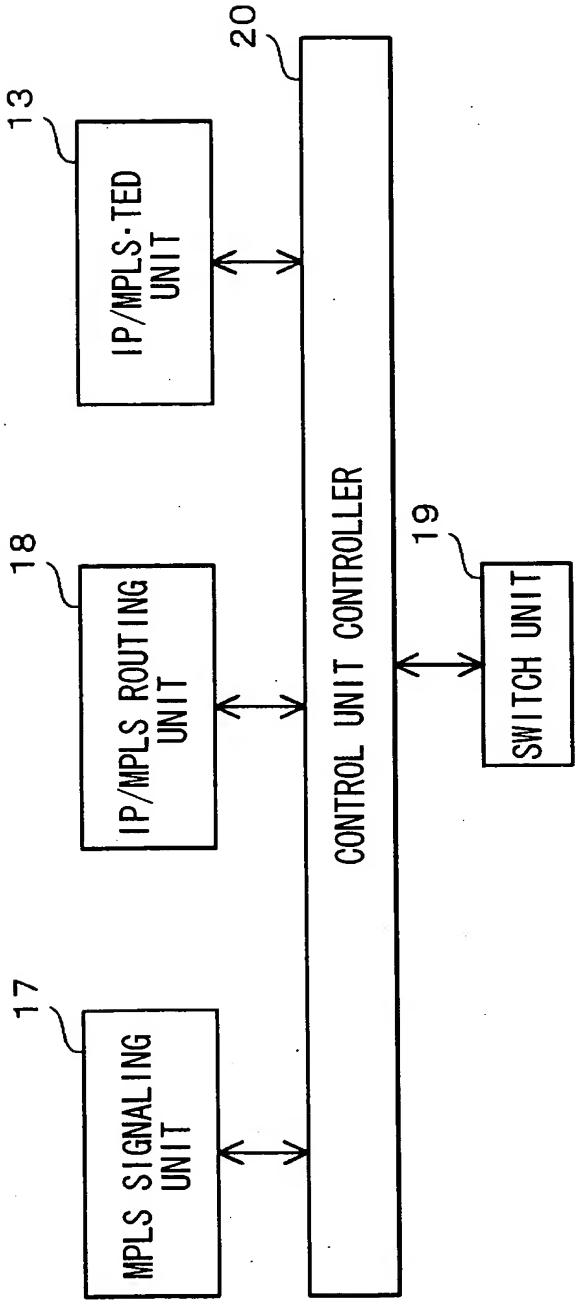

14
GMPLS·TED UNIT
20
CONTROL UNIT CONTROLLER
19
SWITCH UNIT
11
GMPLS ROUTING UNIT
10
GMPLS SIGNALING UNIT

FIG.6


20
13
IP/MPLS·TED UNIT
18
IP/MPLS ROUTING UNIT
17
MPLS SIGNALING UNIT
CONTROL UNIT CONTROLLER
19
SWITCH UNIT

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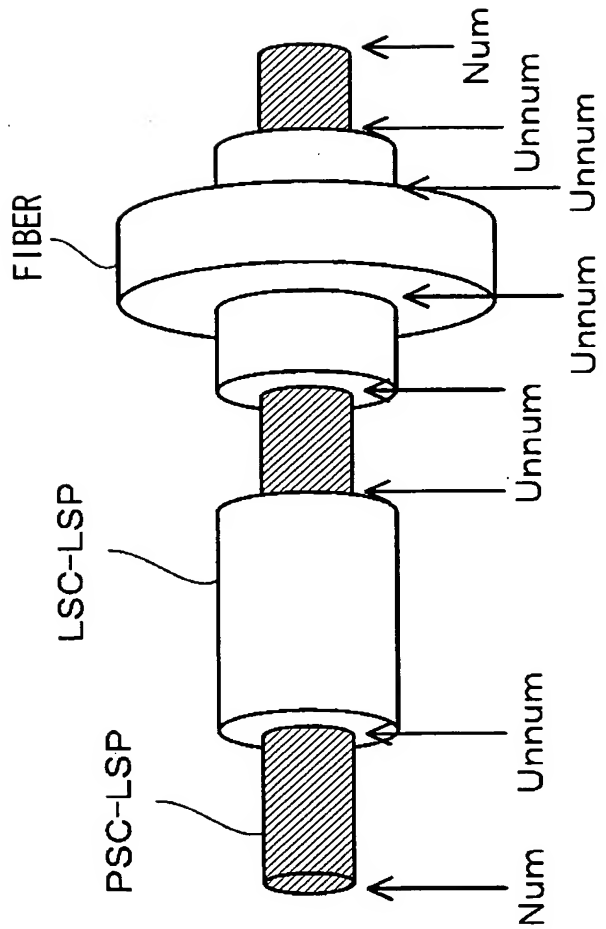


FIG.7A

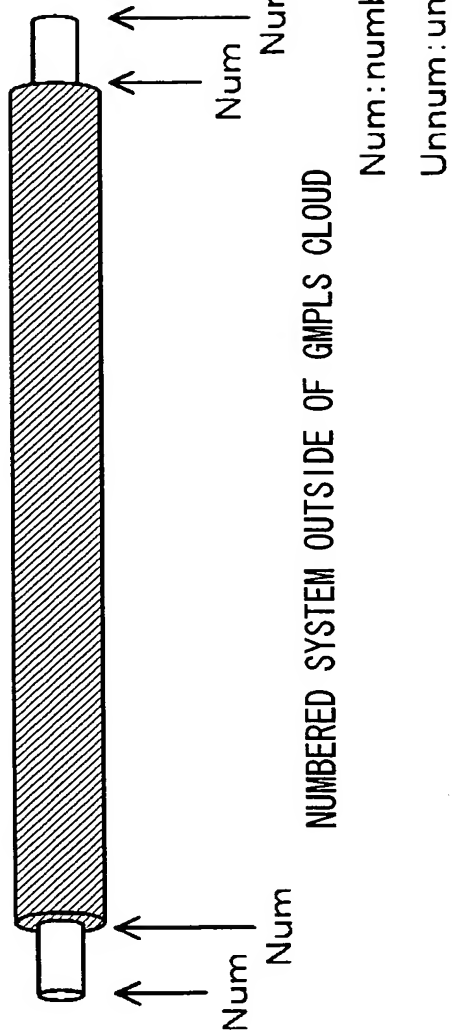


FIG.7B

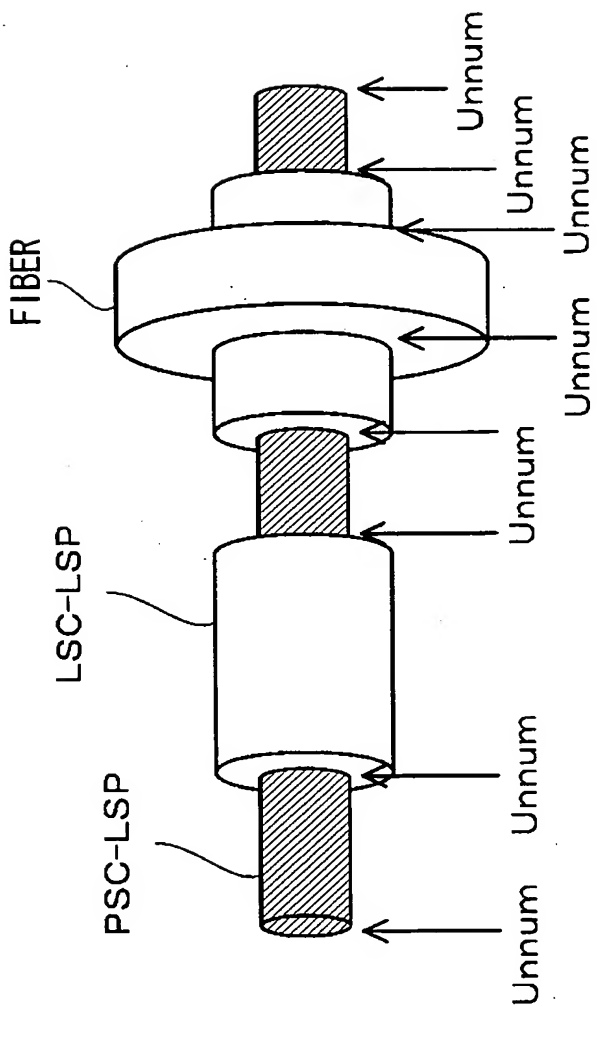

FIBER
LSC-LSP
PSC-LSP
Unnum
Unnum
Unnum
Unnum
Unnum
Unnum
Unnum
NUMBERED SYSTEM IN GMPLS CLOUD

FIG.8A

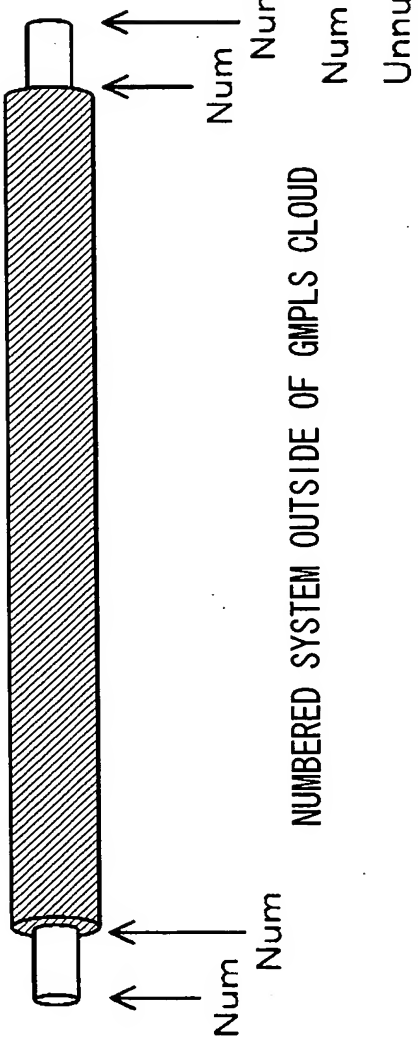

Num
Num
Num
Num
NUMBERED SYSTEM OUTSIDE OF GMPLS CLOUD
Num:numbered
Unnum:unnumbered

FIG.8B

FIG.9

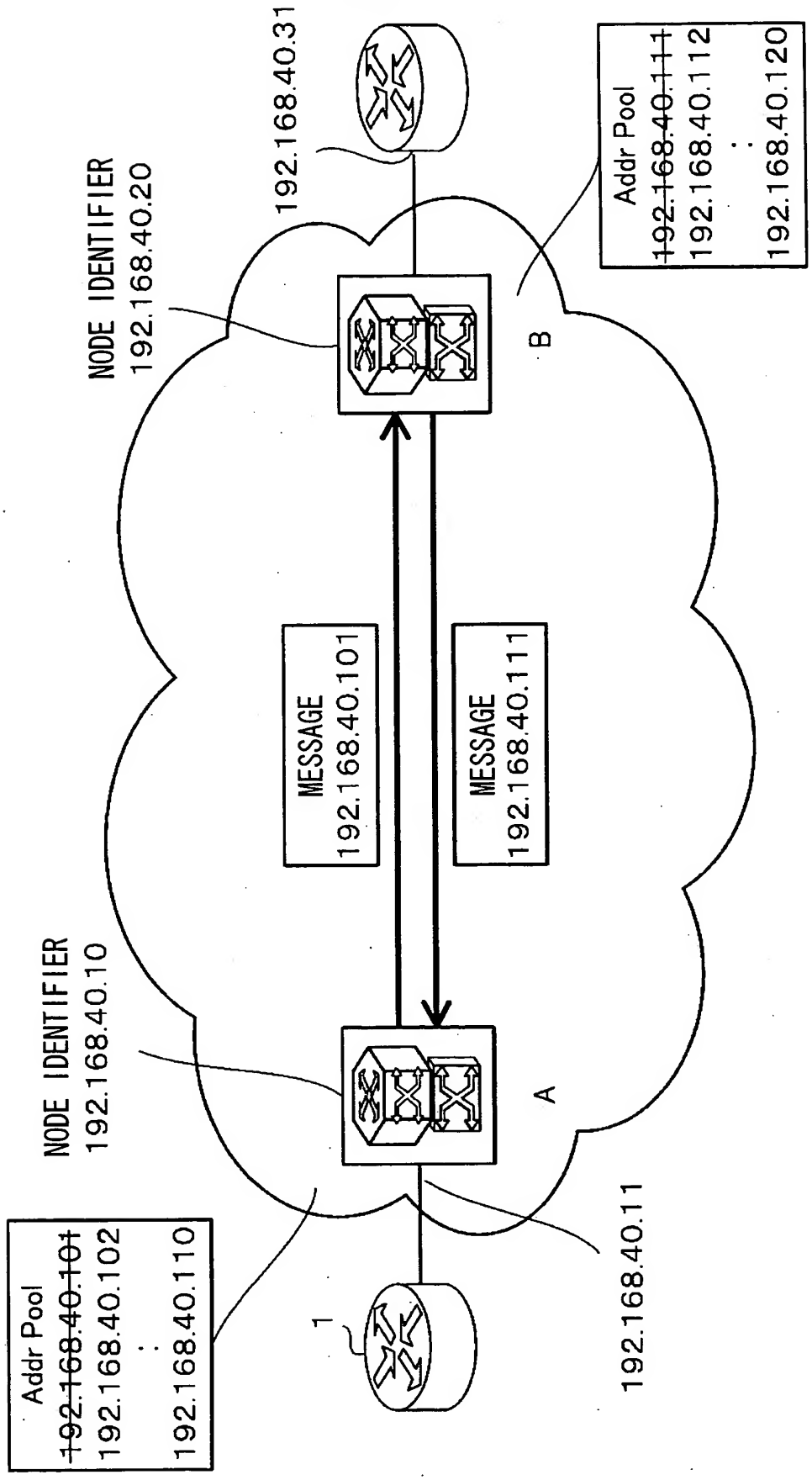

NODE IDENTIFIER
192.168.40.20
192.168.40.31
Addr Pool
192.168.40.111
192.168.40.112
192.168.40.120
B
MESSAGE
192.168.40.101
MESSAGE
192.168.40.111
NODE IDENTIFIER
192.168.40.10
A
Addr Pool
192.168.40.101
192.168.40.102
192.168.40.110
1
192.168.40.11

FIG.10

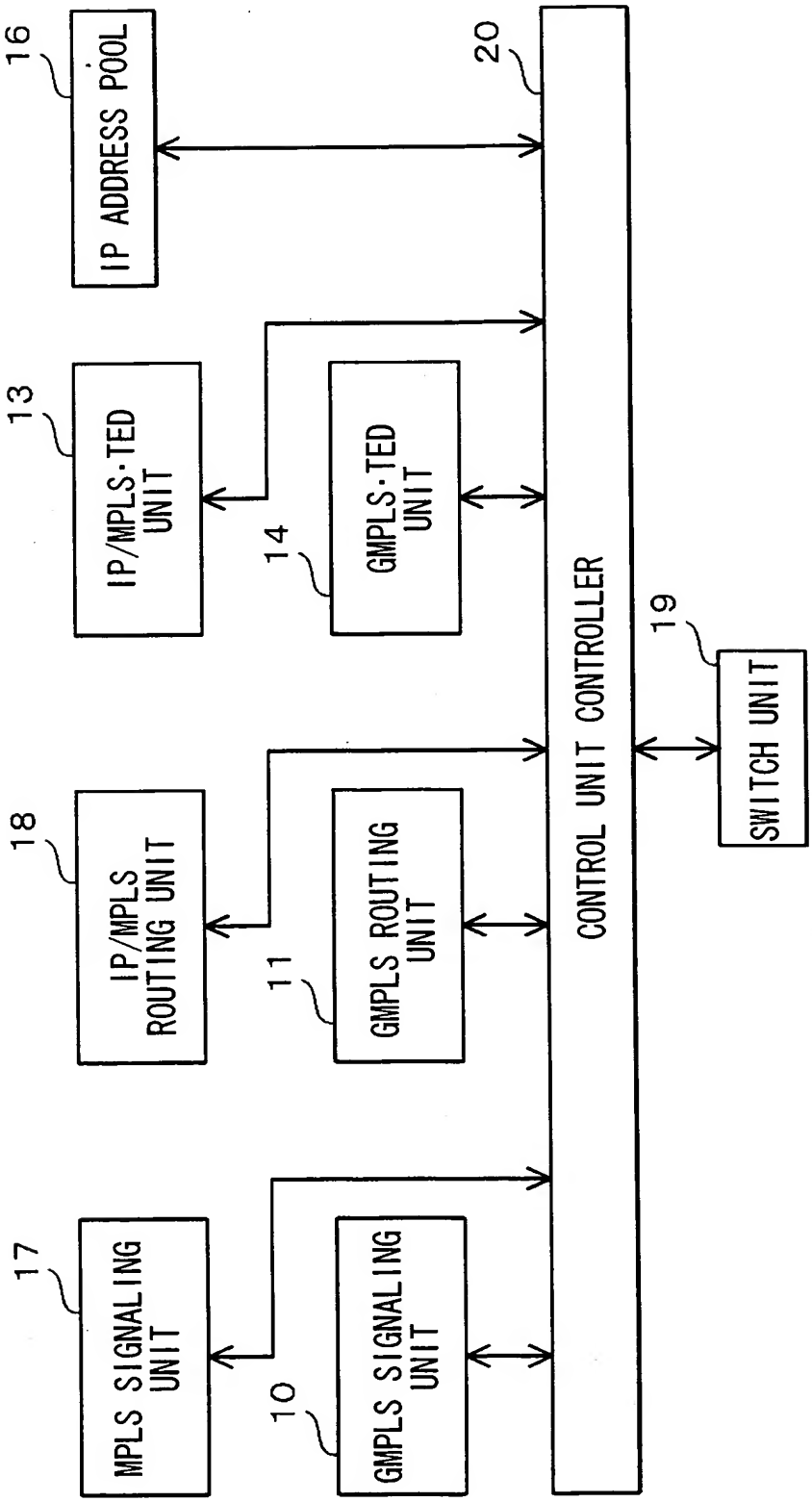

16
IP ADDRESS POOL
20
13
IP/MPLS·TED UNIT
14
GMPLS·TED UNIT
19
SWITCH UNIT
18
IP/MPLS ROUTING UNIT
11
GMPLS ROUTING UNIT
CONTROL UNIT CONTROLLER
17
MPLS SIGNALING UNIT
10
GMPLS SIGNALING UNIT

FIG.11

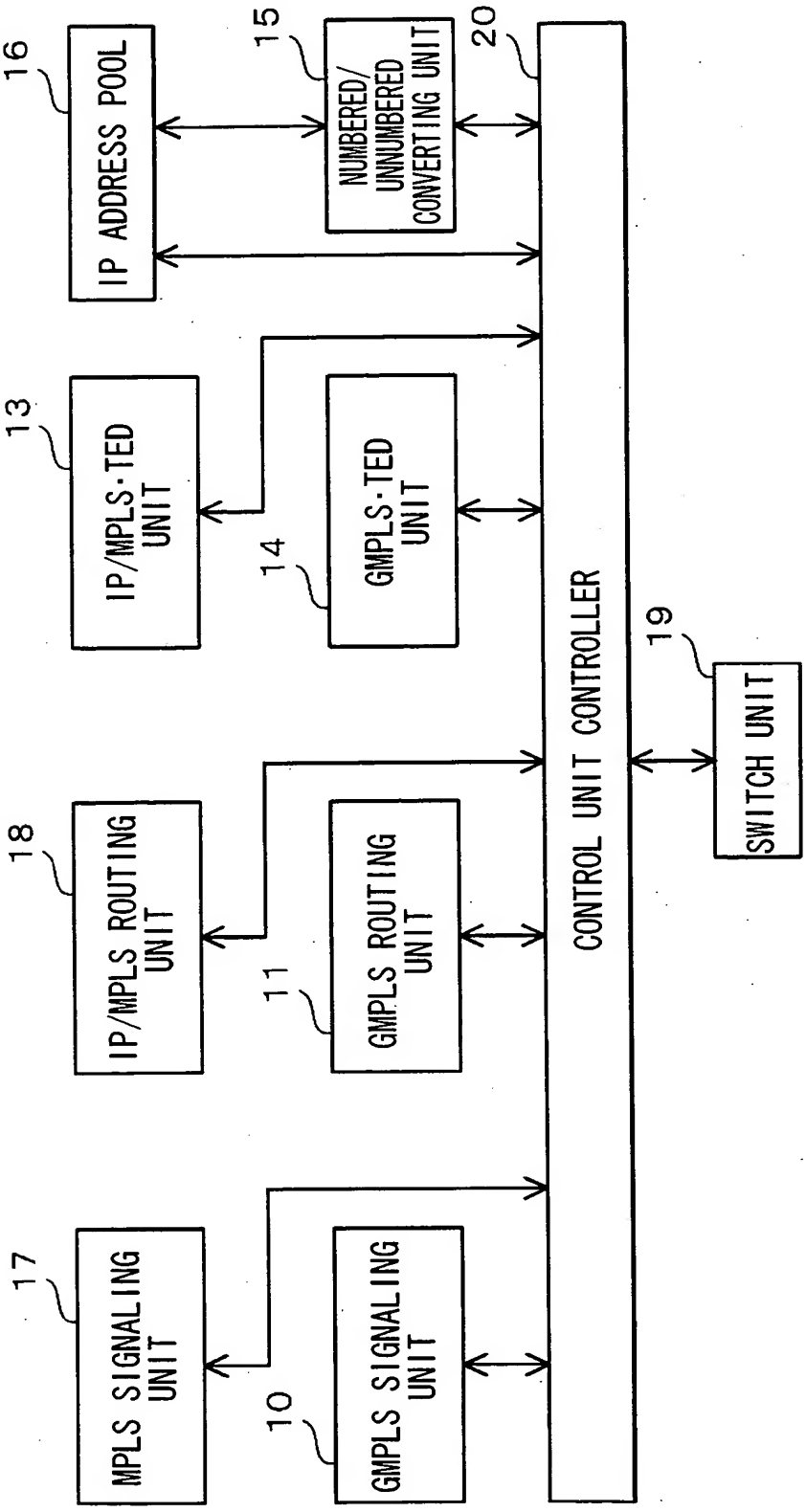
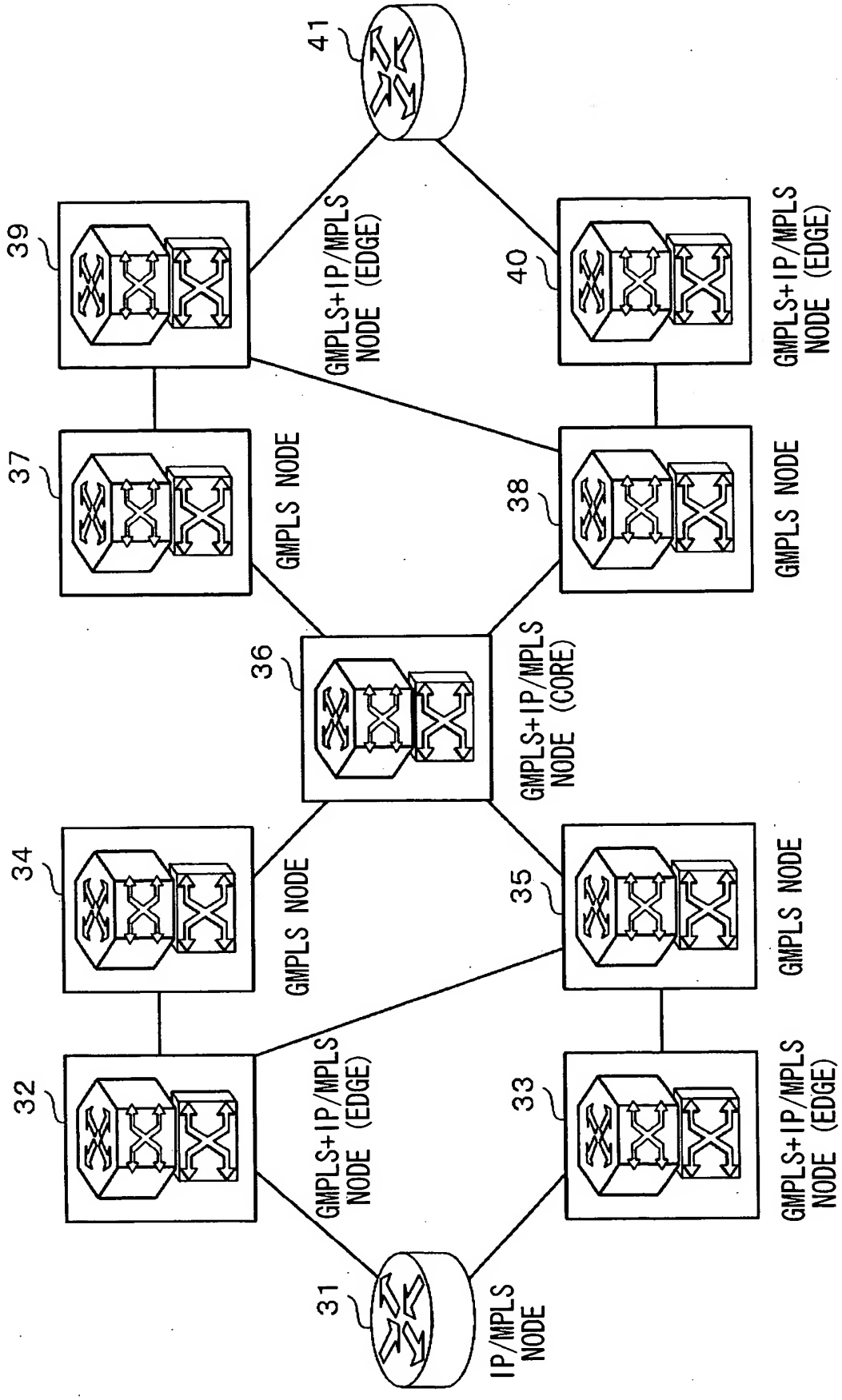

16
IP ADDRESS POOL
15
NUMBERED/
UNNUMBERED
CONVERTING UNIT
20
13
IP/MPLS·TED
UNIT
14
GMPLS·TED
UNIT
19
SWITCH UNIT
18
IP/MPLS ROUTING
UNIT
11
GMPLS ROUTING
UNIT
CONTROL UNIT CONTROLLER
17
MPLS SIGNALING
UNIT
10
GMPLS SIGNALING
UNIT

FIG.12


41
39
GMPLS+IP/MPLS NODE (EDGE)
40
GMPLS+IP/MPLS NODE (EDGE)
37
GMPLS NODE
38
GMPLS NODE
36
GMPLS+IP/MPLS NODE (CORE)
34
GMPLS NODE
35
GMPLS NODE
32
GMPLS+IP/MPLS NODE (EDGE)
33
GMPLS+IP/MPLS NODE (EDGE)
31
IP/MPLS NODE

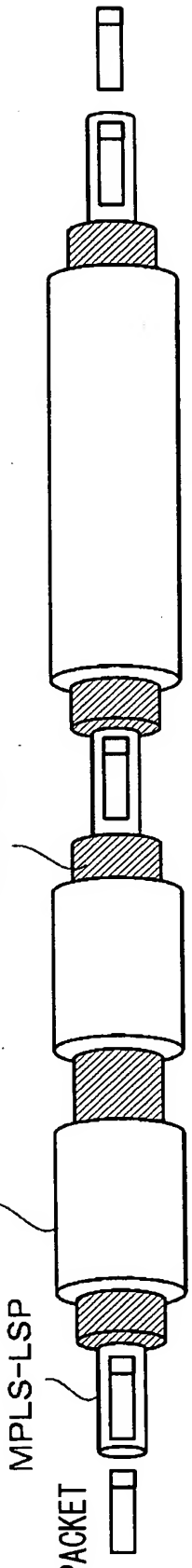


FIG.13A

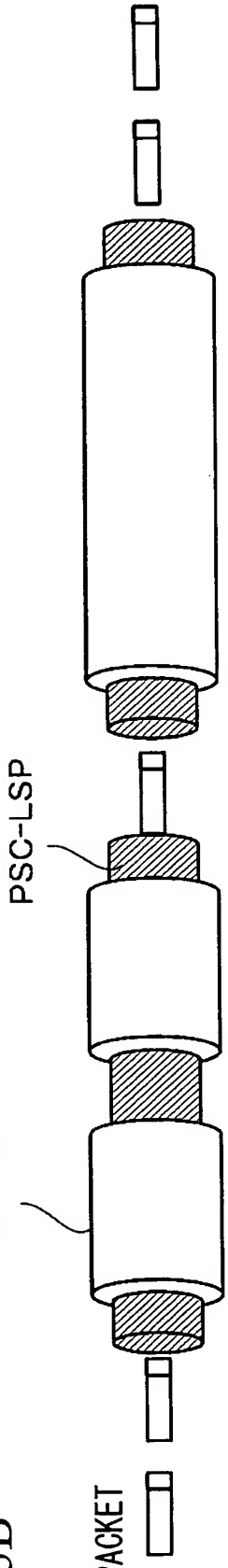


FIG.13B

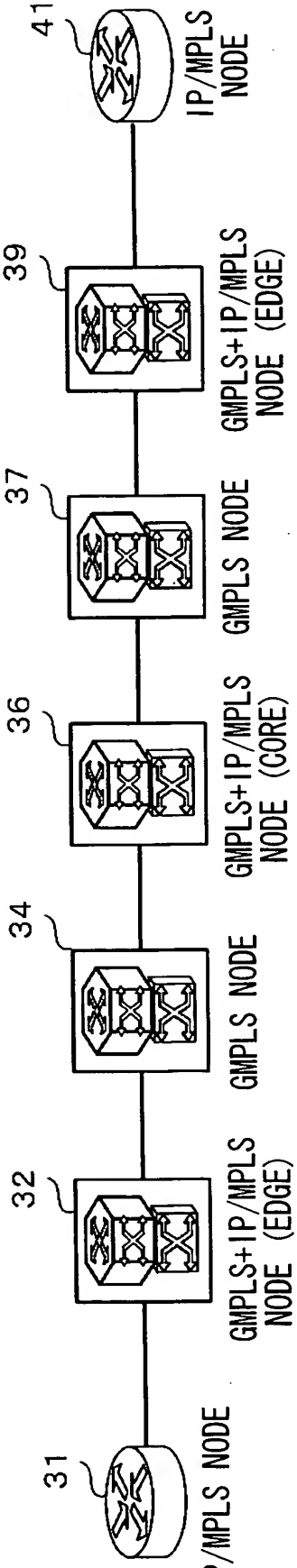


FIG.13C

FIG.14

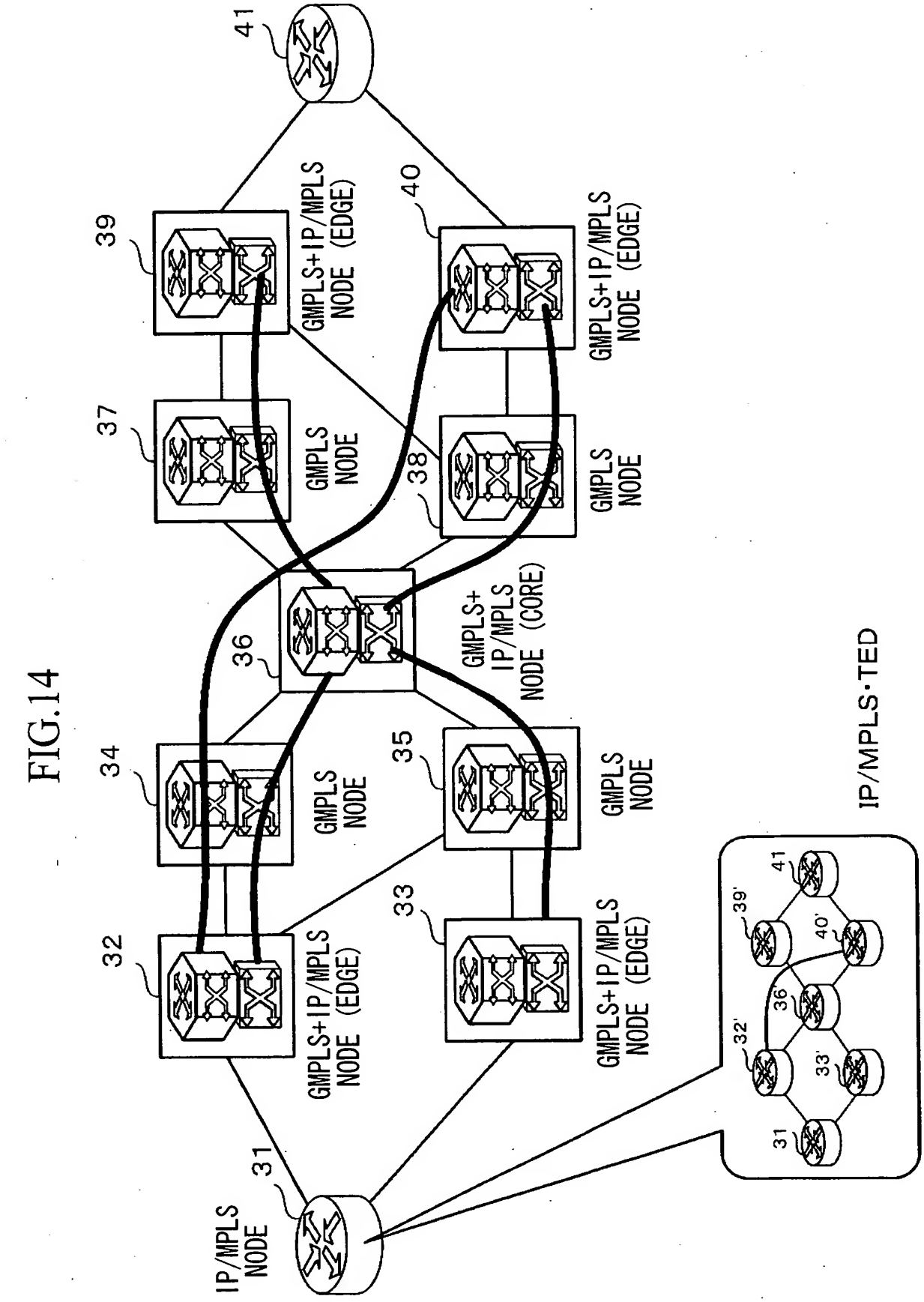

41
39
GMPLS+IP/MPLS NODE (EDGE)
40
GMPLS+IP/MPLS NODE (EDGE)
37
GMPLS NODE
38
GMPLS NODE
36
GMPLS+ IP/MPLS NODE (CORE)
34
GMPLS NODE
35
GMPLS NODE
32
GMPLS+IP/MPLS NODE (EDGE)
33
GMPLS+IP/MPLS NODE (EDGE)
31
IP/MPLS NODE
IP/MPLS·TED
41
39'
40'
36'
32'
33'
31

FIG.15

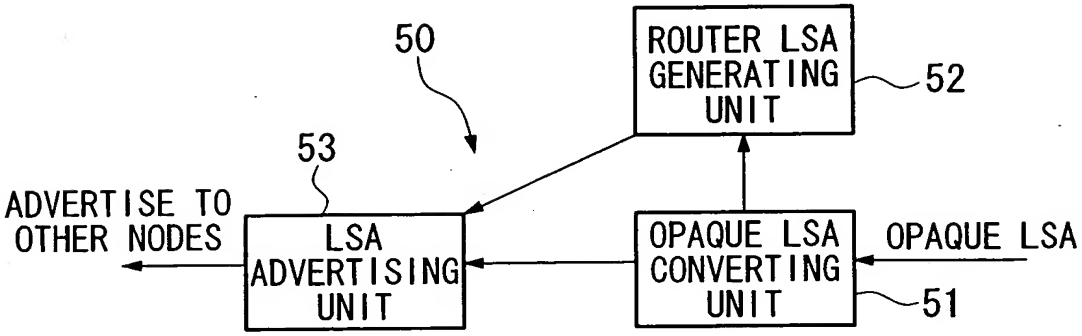

50
ROUTER LSA GENERATING UNIT
52
53
ADVERTISE TO OTHER NODES
LSA ADVERTISING UNIT
OPAQUE LSA CONVERTING UNIT
OPAQUE LSA
51

FIG.16

GMPLS			MPLS		
ITEM	VALUE		ITEM	VALUE	
LINK TYPE	1	POINT-TO-POINT	TYPE	1	POINT-TO-POINT
	2	MULTIACCESS		2	CONNECTION TO A TRANSIT NETWORK
LINK ID	1	NEIGHBORING ROUTER'S ROUTER ID	LINK ID	1	NEIGHBORING ROUTER'S ROUTER ID
	2	DR'S INTERFACE ADDRESS		2	IP ADDRESS OF DESIGNATED ROUTER
LOCAL INTERFACE IP ADDRESS (IN CASE OF NUMBERED SYSTEM)			LINK DATA	1	ROUTER INTERFACE'S IP ADDRESS
LINK LOCAL IDENTIFIERS (IN CASE OF UNNUMBERED SYSTEM)				1	IFINDEX VALUE

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FIG.17

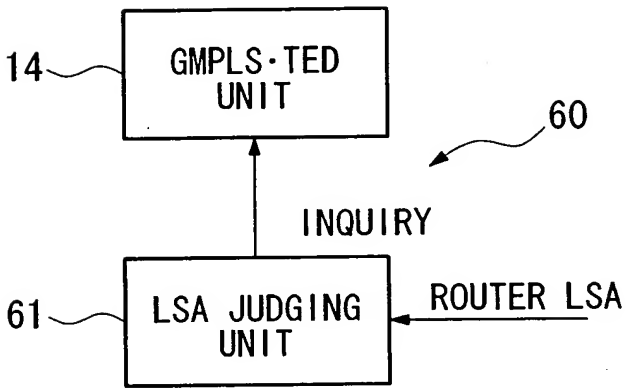


FIG.18

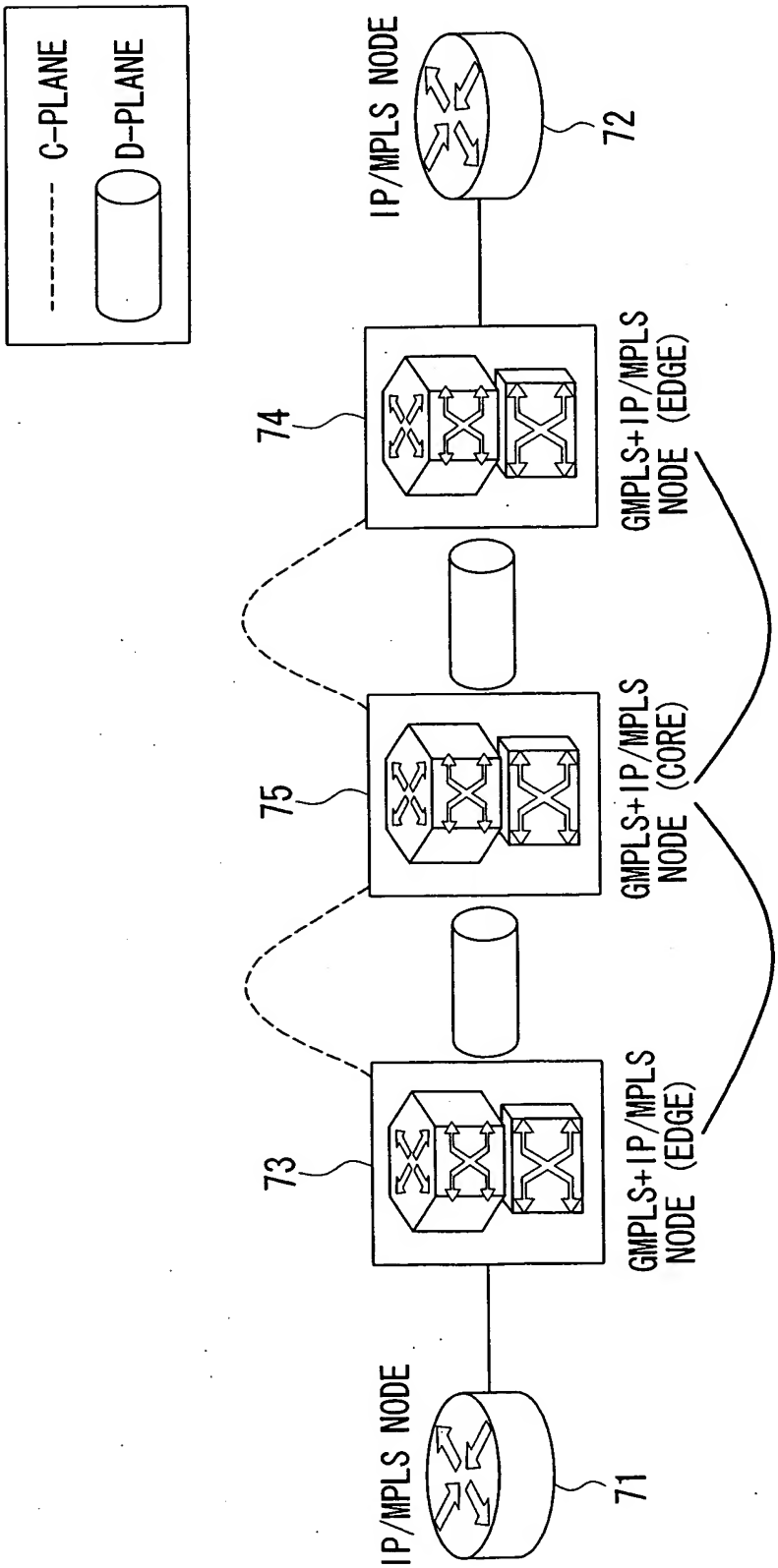

C-PLANE
D-PLANE
IP/MPLS NODE
72
74
GMPLS+IP/MPLS NODE (EDGE)
75
GMPLS+IP/MPLS NODE (CORE)
73
GMPLS+IP/MPLS NODE (EDGE)
IP/MPLS NODE
71

FIG.19

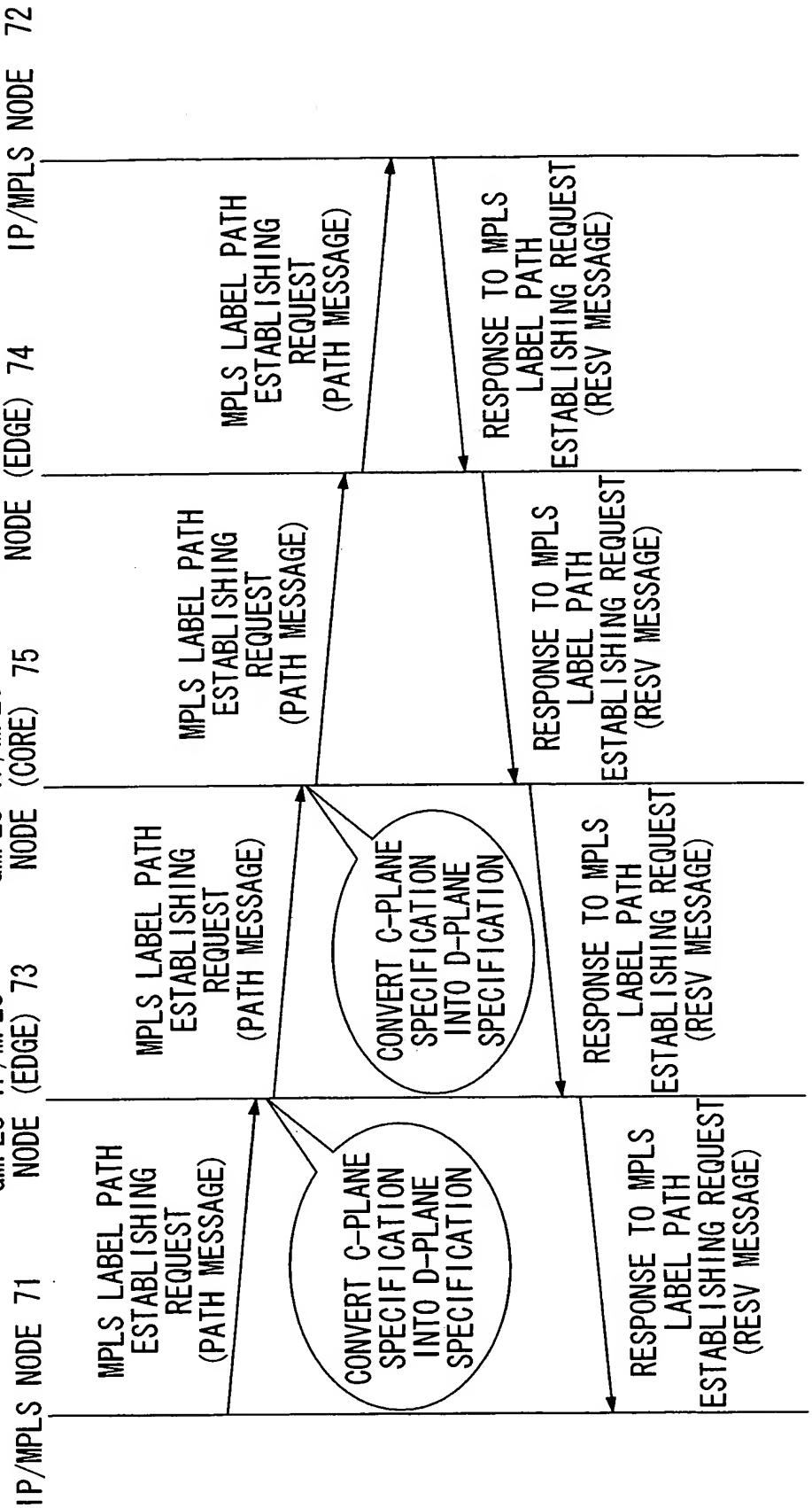

IP/MPLS NODE 71
GMPLS+IP/MPLS NODE (EDGE) 73
GMPLS+IP/MPLS NODE (CORE) 75
GMPLS+IP/MPLS NODE (EDGE) 74
IP/MPLS NODE 72
MPLS LABEL PATH ESTABLISHING REQUEST (PATH MESSAGE)
CONVERT C-PLANE SPECIFICATION INTO D-PLANE SPECIFICATION
MPLS LABEL PATH ESTABLISHING REQUEST (PATH MESSAGE)
MPLS LABEL PATH ESTABLISHING REQUEST (PATH MESSAGE)
MPLS LABEL PATH ESTABLISHING REQUEST (PATH MESSAGE)
RESPONSE TO MPLS LABEL PATH ESTABLISHING REQUEST (RESV MESSAGE)
RESPONSE TO MPLS LABEL PATH ESTABLISHING REQUEST (RESV MESSAGE)
RESPONSE TO MPLS LABEL PATH ESTABLISHING REQUEST (RESV MESSAGE)
RESPONSE TO MPLS LABEL PATH ESTABLISHING REQUEST (RESV MESSAGE)

FIG.20

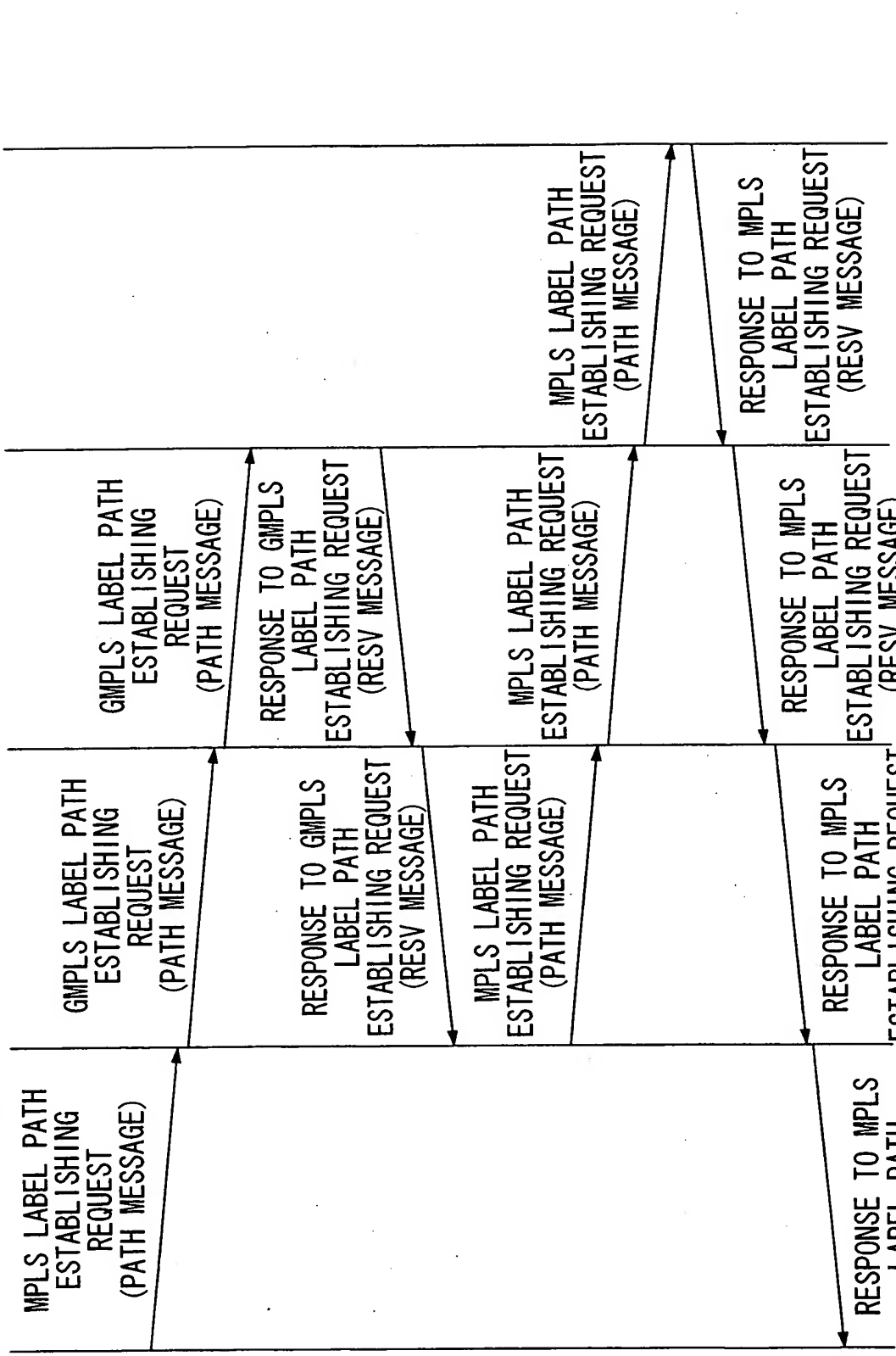

IP/MPLS NODE 71
GMPLS+IP/MPLS NODE (EDGE) 73
GMPLS+IP/MPLS NODE (CORE) 75
GMPLS+IP/MPLS NODE (EDGE) 74
IP/MPLS NODE 72
MPLS LABEL PATH ESTABLISHING REQUEST (PATH MESSAGE)
GMPLS LABEL PATH ESTABLISHING REQUEST (PATH MESSAGE)
GMPLS LABEL PATH ESTABLISHING REQUEST (PATH MESSAGE)
MPLS LABEL PATH ESTABLISHING REQUEST (PATH MESSAGE)
MPLS LABEL PATH ESTABLISHING REQUEST (PATH MESSAGE)
RESPONSE TO GMPLS LABEL PATH ESTABLISHING REQUEST (RESV MESSAGE)
RESPONSE TO GMPLS LABEL PATH ESTABLISHING REQUEST (RESV MESSAGE)
RESPONSE TO MPLS LABEL PATH ESTABLISHING REQUEST (RESV MESSAGE)
RESPONSE TO MPLS LABEL PATH ESTABLISHING REQUEST (RESV MESSAGE)
RESPONSE TO MPLS LABEL PATH ESTABLISHING REQUEST (RESV MESSAGE)

FIG.21

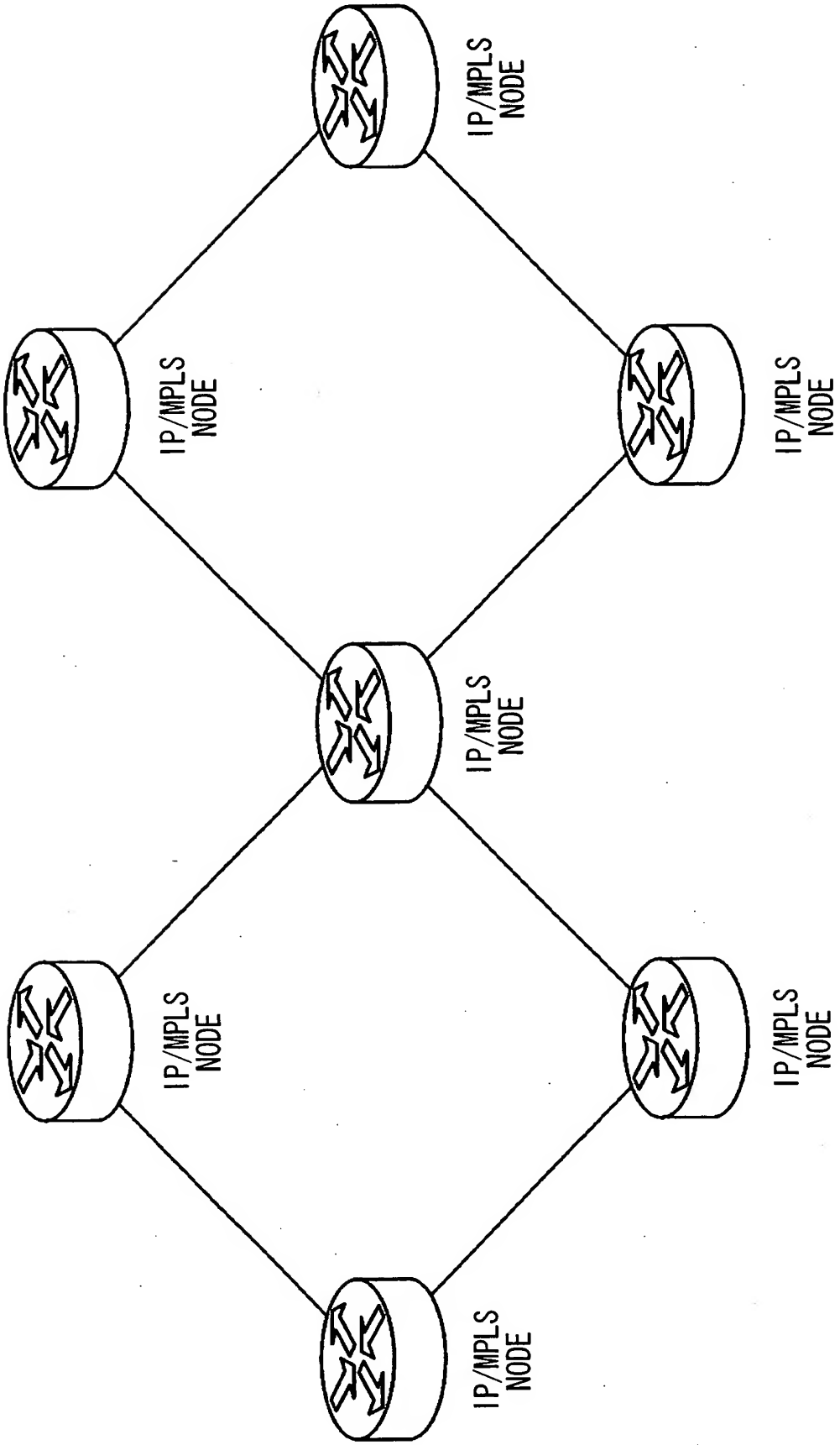
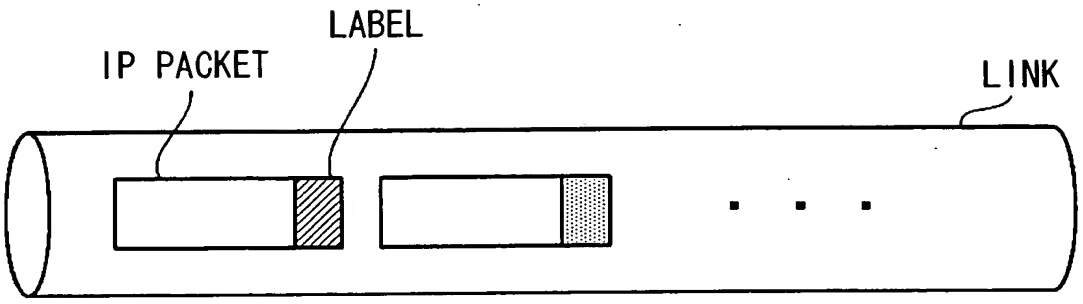
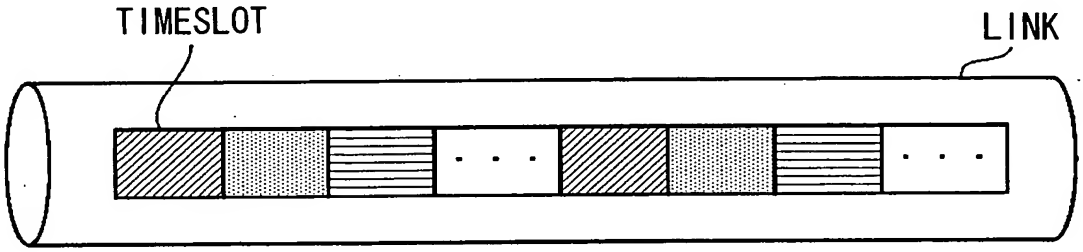

IP/MPLS NODE
IP/MPLS NODE
IP/MPLS NODE
IP/MPLS NODE
IP/MPLS NODE
IP/MPLS NODE
IP/MPLS NODE

FIG.22A



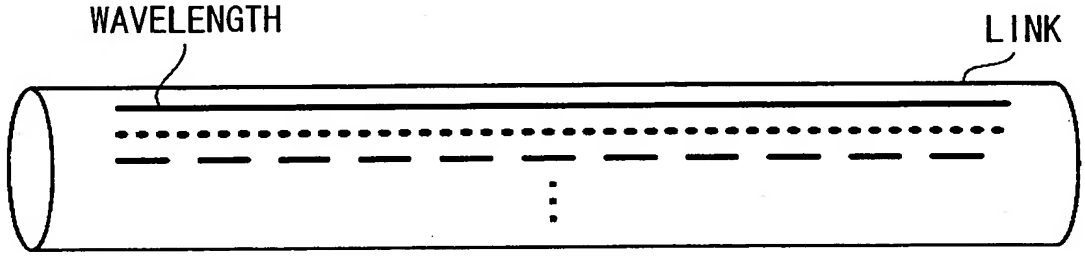
PACKET

FIG.22B



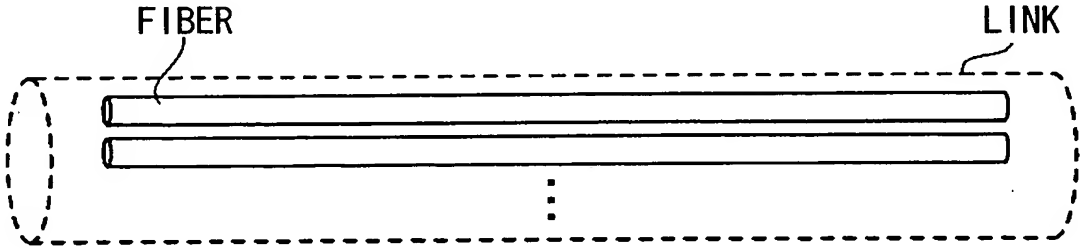
TDM

FIG.22C



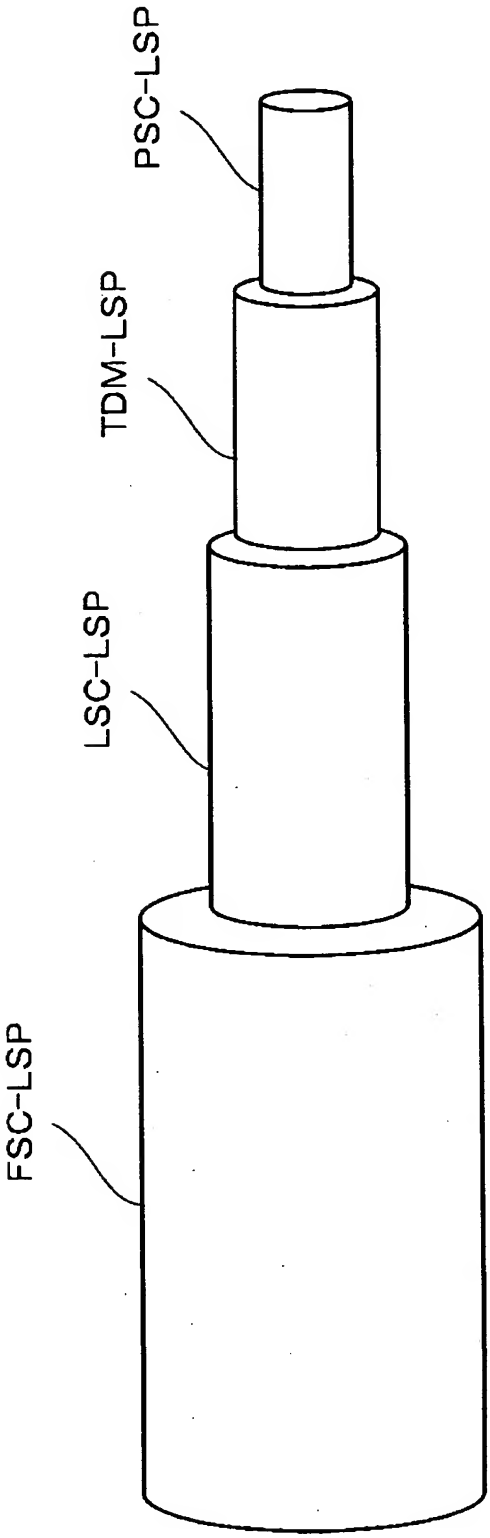
λ

FIG.22D



FIBER

FIG.23



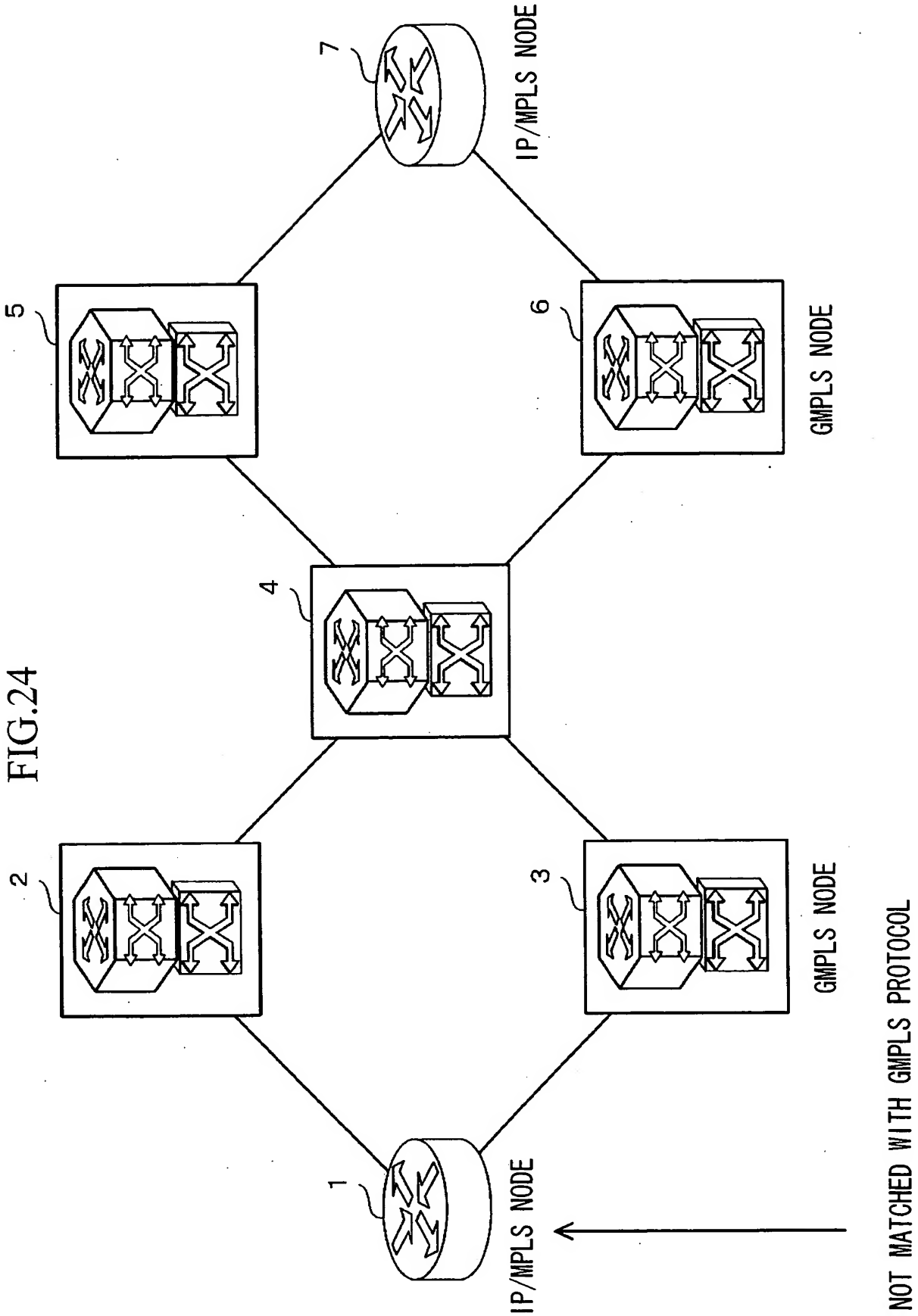
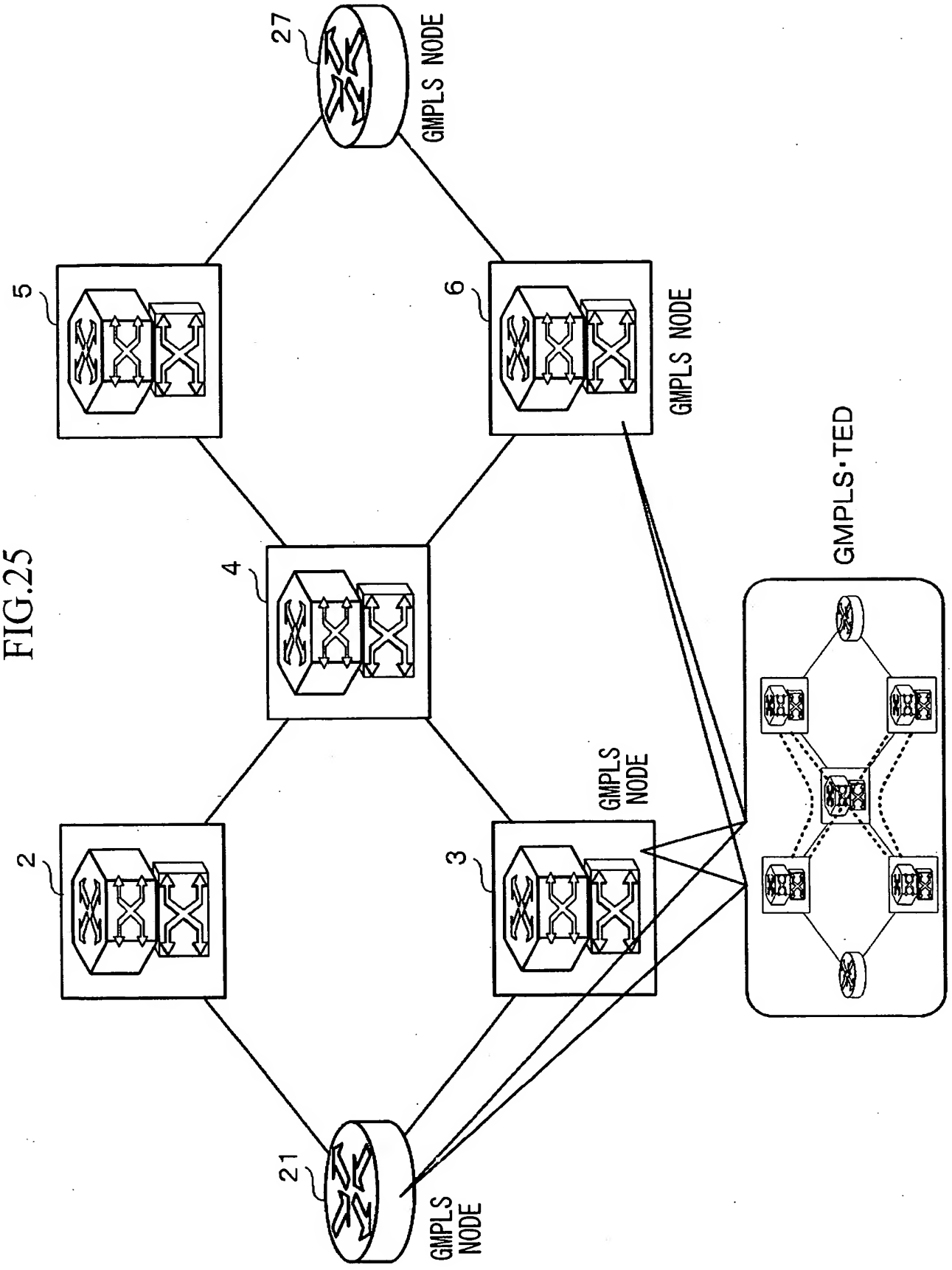

7
IP/MPLS NODE
5
6
GMPLS NODE
4
2
3
GMPLS NODE
1
IP/MPLS NODE
NOT MATCHED WITH GMPLS PROTOCOL

FIG.24

FIG.25


27
GMPLS NODE
5
6
GMPLS NODE
GMPLS·TED
4
GMPLS
NODE
2
3
21
GMPLS
NODE

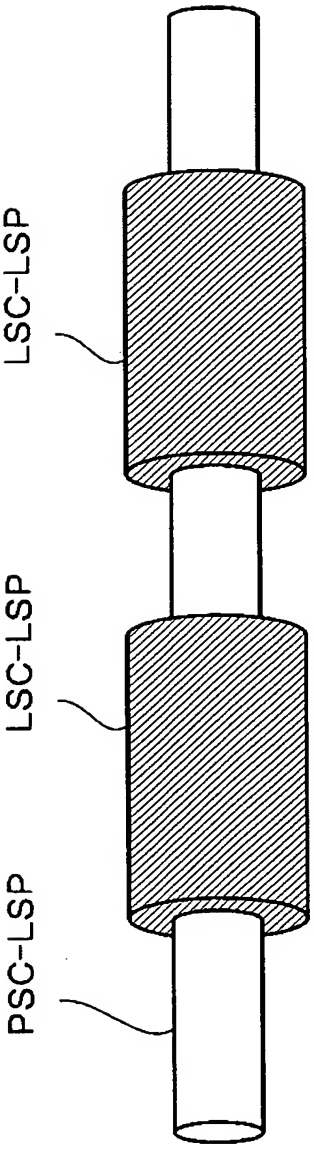


FIG.26A

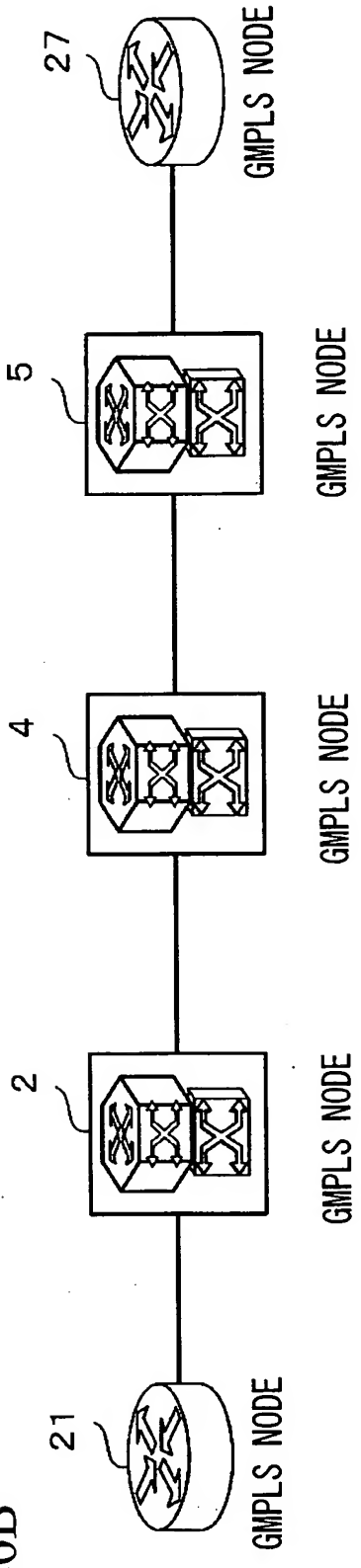
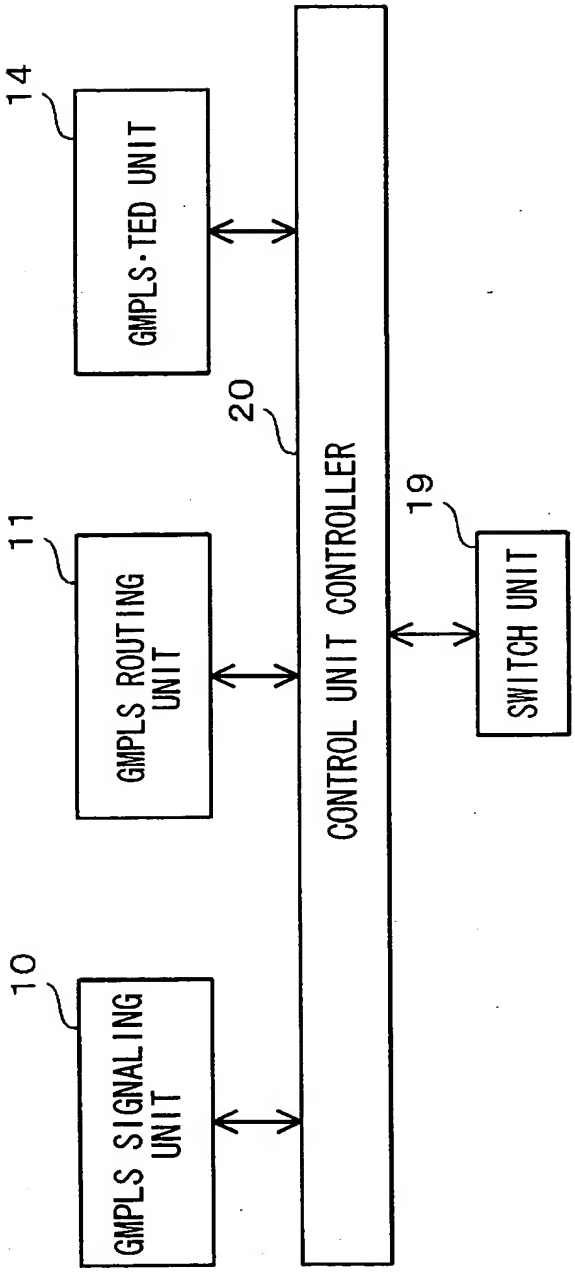


FIG.26B

FIG.27


14
GMPLS·TED UNIT
20
CONTROL UNIT CONTROLLER
19
SWITCH UNIT
11
GMPLS ROUTING UNIT
10
GMPLS SIGNALING UNIT